

SEQUENCE LISTING

<110> Austin-Phillips, Sandra
Burgess, Richard D
German, Thomas L
Ziegelhoffer, Thomas

<120> Transgenic Plants as an Alternative Source of
Lignocellulosic-Degrading Enzymes

<130> Transgenic Plants Expressing Cellulase

<140>
<141>

<150> 08/883,495
<151> 1997-06-26

<160> 32

<170> PatentIn Ver. 2.0

<210> 1
<211> 1621
<212> DNA
<213> Thermomonospora fusca

<400> 1
cgatatggat gatctgacgt ctgaatcccc ttgtcaccct agacattcac ccattttgtc 60
gcttttacgg ctttcttgg gagttctccg tttcaccaag gaacaaaacc gcaacggaga 120
gtaggcgcgg tctttacagc tcccttgcca atggttatcg tccgaacgga aaacgatctg 180
ggagcgcctcc cagccatgctg ctcctcttcg tgcccctcac ttcttttgag ccttgtgctc 240
gttaggagcc ccgaatgtcc cccagacactc ttgcgcgtct tctggcgcc gggcgccgg 300
ccttggtag cgcgctgtct ctggccttcc ggtcgcaagc ggcggccaat gatttccgt 360
tctacgtcaa ccccaacatg tcctccggcg aatgggtcg gaacaacccc aacgaccgc 420
gtaccccggt aatccgcgac cgatcgcca gcgtgccgca gggcacctgg ttgcaccacc 480
acaaccccg gcagatcacc ggccagatcg acgcgctcat gagcgccgccc caggccgccc 540
gcaagatccc gatcctggtc gtgtacaacg ccccgccgca cgactgcggc aaccacagca 600
gcggcgccgc ccccaagtac accgccttacc ggtcctggat cgacgaattc gctgcggac 660
tgaagaacccg tcccgcccac atcatcgctg ggccggaccc gatctcgctg atgtcgagct 720
gcatccagca cgtccagcag gaagtcttgg agacgatggc gtacgcgggc aaggccctca 780
aggccgggtc ctcgcaggcg cgatctact tcgacgccgg ccactcccg tggcactcgc 840
ccgcacagat ggcttccctgg ctccagcagg ccgcacatctc caacagcgcc cacggtatcg 900
ccaccaacac ctccaaactac cggtgaccgc ctgacgaggt cgccctacgccc aaggccgtgc 960
tctcgcccat cggcaaccccg tccctgcgcg cggtcatcgca caccagccgc aacggcaacg 1020
gccccgcccgg taacgagtgg tgcgacccca gcgacgcgc catcgccacg cccagcacca 1080
ccaacacccgg cgaccgcgt atcgacgcct tcctgtggat caagctgcgg ggtgaggccg 1140
acggctgcat cgccggcgcc ggccagttcg tcccgaggc ggcctacgag atggcgatcg 1200

ccgcggcg caccacccc aacccgaacc ccaacccgac gcccacccccc actccgaccc 1260
ccacgccc tccccgctcc tcggggcgt gcacggcgac gtacacgatc gccaacgagt 1320
gaaacgacgg cttccaggcg accgtgacgg tcaccgcgaa ccagaacatc accggctgga 1380
ccgtgacatg gaccctcacc gacggccaga ccatcaccaa cgcttggAAC gccgacgtgt 1440
ccaccagcg ctcctcggtg accgcggGA acgtcgGCC caacggAAC ctctccagg 1500
gagccccac agagttcgGC ttctcgct ctaaggGAA ctccaaCTt gttccgacCC 1560
ttacctgcgc cgccagctga cccctcctgg cagtgcactg ggtggcttag gcgtgctggg 1620
g 1621

<210> 2

<211> 3503

<212> DNA

<213> Thermomonospora fusca

<400> 2

cgcgatccc cctcatcatt caggtgcggT tagttcccc aggctaccGA ggaccGAatt 60
tcggTccgtt tttcttgCGG cgagccCTGA gaccgttCC tggTccgttC cgtcaccATC 120
cttgcgcgtc ccggcgagg gggGAAGAC cccgcgAGAT ggctccGCCA cggcctgttt 180
ccgacccccc tcacaaaAGC ccatttaACG cggTatttAC aaccGGTcat gaagtggcta 240
ctctcttttG ggagcgctCC cgtgccgta gtcacactgg gacgtGAatG gCGTCACGGT 300
agggctcgTC gtgtacacG cattttcGAC cctgcttAA gtcacactgg gacgtGAatG gCGTCACGGT 360
ccagccttCG ggagaACTCC cacacaACCA accgtccGAC gccacttCC cagcgctCAA 420
acggaggcAG cagtGttACAC catccccCGC tcccctCCGG ggcccCGGC cgtcgTCCGC 480
gcaaccACCC cgaccGGTcG gctGAacACT gcaGcGTcG gttctcgacc atccccTTGc 540
gagagaACAT cctccaACCA aggaAGACAC cGATATGAGT aaagttcgtG ccacGAACAG 600
acgttctGgg atgcggcgcG ggctggcAGC cgcctctGGA ctggcgttG ggcctccat 660
gttggcgttC gctgtccGG ccaacGcGCc cggctgctcG gtgtactACA cggtaactC 720
ctggggTacc gggTtcaccG ccaacgtcAC catcACCAAC ctggcAGtG cGatcaACGG 780
ctggaccCTG gagtgggact tccccggAA ccagcaggTG accaACCTGT ggaACGGGAC 840
ctacacccAG tccgggCAGC acgtgtcGGT cagcaACGc ccgtacaACG cctccatCCC 900
ggccaacGGA acggttGAGT tcgggttCAA cggctctAC tcgggcAGc acgacatCCC 960
ctccctcttC aagctGAACG gggttacCTG cGacggcTG gacgacccCG accccGAGCC 1020
cagcccttCC cccagccCTT cccccAGCCC cacAGACCG gatgagccGG gggccccGAC 1080
caacccGCCC accaACCCG gCGAGAAGGT cgacaACCCG ttGAGGGCG ccaAGCTGTA 1140
cgtgaACCCG gtctggTCGG ccaaggCCGC cgttgAGCCG ggCGGTTCCG cggTCGCCAA 1200
cgagtccACC gctgtctGGC tggaccGTat cggcggGATC gagggcAACG acagcccGAC 1260
caccggCTCC atgggtCTGC gCGaccACt ggaggaggCC gtccGCCAGt cgggtggcGA 1320
cccgtgacc atccaggTCG tcatctACCA cctgccccGG cGcGactTGc cCGCgCTGGC 1380
ctccaacGtG gagctgggTC ccGatGAACt cGaccGcTA aagAGcGAGt acatGacCC 1440
gatcgccGac atcatgtGGG acttcGcAGA ctacGAGAac ctGcgGatcG tcGCCatCAT 1500
cgagatcGac tccctGCCA acctcGtAC caacGtGGGc ggGAACGGCG GcAccGAGCT 1560
ctgCGCCTAC atGAAGCAGA acggcggcTA cgtcaacGgt gtGggctAcG ccctccGCAA 1620
gttggcGAG atccGAACG tctacaACTA catcgacGCC gcccACCCAG gctggatcGG 1680
ctgggactCC aacttcGgCC cctcggtGGA catcttctAC gaggccGCCA acgcctCCGG 1740
ctccaccGTG gactacGTc acggcttCAT ctccaACACG gccaACTACT cggccACTGT 1800
ggagccGtAC ctggacGtCA acggcAccGT taacGGGCCAG ctcatCCGCC agtccaAGtG 1860
gttggactGG aaccAGTACG tcgacGAGt ctccTcGTC caggacCTGc gtcaggccCT 1920
gatcgccaAG ggctccGGT ccgacatCGG tatGtCAtC gacacCTCCC gcaacGGcTG 1980

0
1
2
3
4
5
6
7
8
9

gggtggcccg aaccgtccga ccggaccgag ctccctccacc gacctaaca cctacgttga 2040
cgagagccgt atcgaccgccc gtatccaccc cgtaactgg tgcaaccagg ccgggtgcggg 2100
cctcggcgag cggcccacgg tcaacccggc tcccggttt gacgcctacg tctgggtgaa 2160
gccccccgggt gagtccgacg gcgcacgca ggagatccc aacgacgagg gcaagggctt 2220
cgaccgcatt tgccgaccggc cctaccaggc caacgcccgc aacggcaaca accccctcgga 2280
tgccgctgccca aacgccccca tctccggcca ctggttctct gcccagttcc gcgagctgct 2340
gccaacgcac taccgcctc tgtaaagcg agtggggcaa cggctgacag cctcaacgag 2400
gaactgatca gcacccctca gccggagacg gcgcggctcc actcccccgtg ggcggggcgc 2460
gcttttatgc cgaccgtgc cccagccca aggggcacgg gtcggcttat tccggcgatg 2520
tcggtcacgt cgccctagca cccggaaacg ccgagaaaga ctgccccgaa acggtcctct 2580
cccatccctg cattaggtt gccgagtcg cctatggctt cgtggggcgg aacccaaccc 2640
accatcaacg agaggtatca ccatggccag tgggtgaaa ttcaatgtgc tgacggttcc 2700
tcccggtgcc ggcgccaccc cggaggacgt ttgccaagcg cgcaggcctc gtggagaacc 2760
gggcccgggtt tcacgagttc caactgcccgc cggggcgcga cgggacggac aagtacatcg 2820
tctacacgcg ctggcgctcc ggagaggact accagaactg gctgaacagc gaggccttcc 2880
agcgcggaca cgcggcggcc tctgaagact cccggcgcag cagccaggcgg ggcggccgg 2940
cgtccgcgag tgaactctgg tccttcgaag tcgtccagca cgtccaggcc caggactgat 3000
cccggtgcgg ccctcggttc ttaccgggg gcccggccacc cccttcatcc cttttcttct 3060
cccccgccacc ccttttgcatt tgcaatgatg gaattcgca ttcttgagaa ggcgcgtcg 3120
gtcccatgacc gcgcagaagg caggacgacc acgcgtaccg gtcgacatcg aaggagtcaa 3180
ctgacagttgg ggactatcgc ggggctgatt gtcgcgtgt caggcggtgg gatggtctcg 3240
gccaacgtgc tcccggtggc accgtcgac cggcatccg tggccccgc cacctcgccag 3300
ggcagcagggtt ctcccatgac gcccggagccc tcgcgtcccc ggtacccca ctcgtgcgt 3360
ccgtggtcga agaggtgccc agcgcaagcg gagaactgcg ggtcgtcgaa ggtgacgggg 3420
aggtcgtcggt cgaaggcacg ctccctcgct acctgggtgg a ggtcgaagaa gggcttcccg 3480
gagaccccgccg cgaacttcgct gca 3503

<210> 3

<211> 21

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: VSP Leader
Sequence

<400> 3

Met Lys Leu Phe Val Phe Phe Val Ala Ala Val Val Val Leu Val Ala Trp
1 5 10 15

Pro Cys His Gly Ala

20

<210> 4

<211> 25

<212> DNA

<213> Artificial Sequence

© 2002 Bio-Rad Laboratories

<220>
<223> Description of Artificial Sequence: Xba E2 PCR
Primer

<400> 4
gctctagatg aatgattctc cgttc

25

<210> 5
<211> 17
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Xba E2 PCR
Primer

<400> 5
tgaccggcag caaaatg

17

<210> 6
<211> 25
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Xba E3 PCR
-Primer

<400> 6
gctctagatg gccggctgct cggtg

25

<210> 7
<211> 23
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: RIE3 PCR
Primer

<400> 7
ggaattctta cagaggcgaa tag

23

<210> 8
<211> 3004
<212> DNA
<213> Acidothermus cellulolyticus

<300>

<400> 8

gatccacgt tgtacaaggta cacctgtccg tcgttctggta agagcggcgg gatggtcacc 60
cgcacgatct ctcctttgtt gatgtcgacg gtcacgtggta tacgggttgc ctcggcccg 120
attttcgcgc tcgggcttgc tccggctgtc ggggttcgggtt tggcgtgggtg tgccggagcac 180
gccgaggcga tcccaatgag ggcaaggcga agagcggagc cgatggcacg tcgggtggcc 240
gatggggtagc gccgatgggg cgtggcgcc ccggcccgga cagaaccgga tgccgaatag 300
gtcacggtgac gacatgttgc cgtaccggcg acccggatga caagggtggg tgccgggtc 360
gcctgtgagc tgccggctgg cgtctggatc atggaaacga tcccaccatt ccccgcaatc 420
gacgcgatcg ggagcaggcgc ggccgcgagcc ggaccgtgtg gtcgagccgg acgattcgcc 480
catacggtgac tgcaatgccc agcgccatgt tgtaatccg ccaaattgcag caatgcacac 540
atggacaggg attgtgactc tgagtaatga ttggattgcc ttcttgcgc ctacgcgtta 600
cgccagatgtat gcggttagtt ggcgctccag ccgtggctg gacatgcctg 660
ctgcgaactc ttgacacgtc tggttaacg cccaataactc ccaacaccga tgggatcggtt 720
ccataaaggta tccgtctcac aacagaatcg gtgcgcctc atgatcaacg taaaaggagt 780
acgggggaga acagacgggg gagaaaccaa cgggggattt gcggtgcgc gcgcattcg 840
gcgagtgctt ggctcgccgg tgatgtcg ggtcgccgtc gtcgtcgccg tgctggcatt 900
gttgtccgca ctcgccaacc tagccgtgcc gcggccggct cgcgcgcgg gcggcggcta 960
ttggcacacg agcggccggg agatcctgga cgcgaaacac gtgcgggtac ggatcgccgg 1020
catcaactgg tttgggttcg aaacctgaa ttacgtcg gacggctctt ggtcacgcga 1080
ctaccgcacg atgctcgacc agataaaagtc gtcggctac aacacaatcc ggctgcgtta 1140
ctctgacgac attctcaagc cgggcacccat gccgaacagc atcaattttt accagatgaa 1200
tcaggacctg cagggtctga cgtccttgca ggtcatggac aaaatcggt cgtaacgcgg 1260
tcagatcggc ctgcgcacca ttcttgaccg ccaccgaccg gattgcacgc ggcagtcggc 1320
gctgtggta acgagcagcg tctcgaggac tacgtggatt tccgacccgtc aagcgctggc 1380
- gcagcgctac aaggaaacc cgacggtcgt cggcttgc ttgcacaacg agccgcata 1440
cccgccctgc tgggctgcg gcgatccgag catcgactgg cgattggccg ccgagcggc 1500
cgaaaaacgcc gtgcgtcg tgaatccgaa cctgcttatt ttgcgtcgaa gttgtcgag 1560
ctacaacgga gactcctact ggtggggcg caacctgcaa ggagccggcc agtacccgg 1620
cgtgcgtgaaac gtgcgaacc gcctgggtta ctggcgcac gactacgcga cgagcgtcta 1680
cccgacacg tggttcagcg atccgacccat ccccaacaac atgcccggca tctggaacaa 1740
gaactggga tacctttca atcagaacat tgccacggta tggctggcg aattcggtac 1800
gacactgcaa tccacgaccg accagacgtg gctgaagacg ctgcgtccagt acctacggcc 1860
gaccgcgcaaa tacgtcgccg acagttcca gtggacccctt tggctcttgcg accccgattc 1920
cgccgacaca ggagaaattc tcaaggatga ctggcagacg gtcgacacag taaaagacgg 1980
ctatctcgcc ccgatcaagt cgtcgatattt cgatcctgtc ggcgcgtctg catgccttag 2040
cagtcaacccg tccccgtcg tgcgtccgtc tccgtcgccg agcccgctgg cgagtcggac 2100
gccgcacgc actccgacgc cgacagcccg cccgacgcac acgctgaccc ctactgctac 2160
gccccacgccc acggcaagcc cgacggccgtc accgacggca gcctccggag cccgctgcac 2220
cgcgagttac caggtcaaca gcgattgggg caatggcttc acggtaacgg tggccgtgac 2280
aaattccgga tccgtcgca ccaagacatg gacggtcagt tggacattcg gcggaaatca 2340
gacgattacc aattcgtgga atgcagcggt cacgcagaac ggtcagtcgg taacggctcg 2400
gaatatgagt tataacaacg tgattcagcc tggcagaac accacgttcg gattccaggc 2460
gagctatacc ggaagcaacg cggcaccgac agtcgcctgc gcagcaagtt aatacgctgg 2520
ggagccgacg ggagggtccg gaccgtcggt tccccggctt ccacctatgg agcgaacccca 2580
acaatccgga cggaactgca ggtaccagag aggaacgaca cgaatgcccgc ccatctcaaa 2640

acggctgcga gccggcgtcc tcgcccgggc ggtgagcatc gcagcctcca tcgtgccgt 2700
ggcgatgcag catcctgcca tcgcccgcac gcacgtcgac aatccctatg cgggagcgac 2760
cttcttcgtc aaccctgtact gggcgcaaga agtacagagc gaacggcga ccagaccaat 2820
gccactctcg cagcgaaaat gcgcgtcggt tccacatatt cgacggccgt ctggatggac 2880
cgcatcgctg cgatcaacgg cgtcaacggc ggacccggct tgacgacata tctggacgccc 2940
gccctctccc agcagcaggg aaccacccct gaagtcatgg agattgtcat ctacgatctg 3000
ccgg 3004

<210> 9
<211> 2220
<212> DNA
<213> Trichoderma reesei

<300>
<308> Genbank E00389
<309> 1997-09-29
<310> JP 1985149387-
<312> 1985-08-06

<400> 9
aaggtagcc aagaacaata gccgataaaag atagcctcat taaacggaat gagctagtag 60
gcaaagtca gcaatgtgta tatataaagg ttcgaggtcc gtgcctccct catgctctcc 120
ccatctactc atcaactca gatcctccagg agacttgtac accatcttt gaggcacaga 180
aacccaatag tcaaccgcgg actggcatca tgtatcgaa gttggccgtc atcacggcct 240
tcttggccac agctcgtgct cagtcggcct gcactctcca atcggagact cacccgcctc 300
tgacatggca gaaatgctcg tctgggtggca ctggcactca acagacaggc tccgtggta 360
tcgacgcca ctggcgctgg actcacgcta cgaacacgag cacgaactgc tacgatggca 420
acacttggag ctcgacccta tgtcctgaca acgagacctg cgcaagaac tgctgtctgg 480
acggtgcgcg ctacgcgtcc acgtacggag ttaccacgag cgtaacagc ctctccattg 540
gctttgtcac ccagtctgca cagaagaac ttggcgctcg ccttacatt atggcgagcg 600
acacgaccta ccaggaattc accctgcttgc aacacgagtt ctcttcgat gttgatgttt 660
cgcagctgcc gtaagtgact taccatgaac ccctgacgta tcttcttgc ggctcccagc 720
tgactggcca atttaaggtg cggcttgaac ggagctctct acttcgtgtc catggacgcg 780
gatggtgccg ttagcaagta tcccaccaac aacgctggcg ccaagtacgg cacgggtac 840
tgtgacagcc agtgtccccg cgatctgaag ttcatcaatg gccagccaa cgttgaggc 900
tgggagccgt catccaacaa cgcaaacacg ggcattggag gacacggaaatg ctgctgtct 960
gagatggata tctgggaggc caactccatc tccgaggctc ttacccccc cccttgacacg 1020
actgtcgcc aggagatctg cgagggtgat ggtgcccgg gaacttactc cgataacaga 1080
tatggccgca cttgcgatcc cgatggctc gactggaaacc cataccgcct gggcaacacc 1140
agcttctacg gcccggctc aagcttacc ctgcataccca ccaagaaatt gaccgttgc 1200
acccagttcg agacgtcggt tgccatcaac cgatactatg tccagaatgg cgtcaatttc 1260
cagcagccca acgcccggct tggttagttac tctggcaacg agctcaacga tgattactgc 1320
acagctgagg agacagaatt cggcgatct ctttctcaga caagggcggc ctgactcagt 1380
tcaagaaggc tacctctggc ggcattggat tggtcatgag tctgtggat gatgtgagtt 1440
tgatggacaa acatgcgcgt tgacaaagag tcaaggcgt gactgagatg ttacagtact 1500
acgccaacat gctgtggctg gactccaccc acccgacaaa cgagacctcc tccacacccg 1560
gtgcgtgcg cggaaagctgc tccaccagct ccgggttccc tgctcaggc gaatctcagt 1620
ctcccaacgc caaggtcacc ttctccaaca tcaagttcgg acccattggc agcaccggca 1680

accctagcg cgccaacctt cccggcgaa accgtggcac caccaccacc cgccgcccag 1740
ccactaccac tggaaagctct cccggaccta cccagtctca ctacggccag tgccgcgta 1800
ttggctacag cggccccacg gtctgcgcca gcggcacaac ttgccaggc tcgaaccctt 1860
actactctca gtgcctgtaa agctccgtgc gaaagcctga cgcaccggta gattcttggt 1920
gagcccgat catgacggcg gcgggagcta catggcccg ggtgatttat ttttttgta 1980
tctacttctg accctttca aatacggt caactcatct ttcaactggag atgcggcctg 2040
cttggtattt cgtatgttc agcttggcaa attgtggct tcgaaaacac aaaacgattc 2100
cttagtagcc atgcattttta agataacgga atagaagaaa gaggaaatta aaaaaaaaaa 2160
aaaaacaaac atccgttca taacccgtag aatcgccgct cttcgtgtat cccagtagcca 2220

<210> 10
<211> 21
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Nar E1 PCR
Primer

<400> 10
cgggcgccg gcggcgcta t 21

<210> 11
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Sac E1 PCR
Primer

<400> 11
ccgagcttt aacttgctgc 20

<210> 12
<211> 25
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Sac Elcd PCR
Primer

<400> 12
tggagctcta gacaggatcg aaaat 25

<210> 13
<211> 76

© 2007-2008 - 2009 - 2010 - 2011 - 2012 - 2013

<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: VSP leader
coding sequence

<400> 13
tctagagtgc accatgaagt tgtttgttt ctttgtgct gcagtagttt tggtagcatg 60
gccatgccat ggcgcc 76

<210> 14
<211> 24
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: CBH2-2 PCR
Primer

<400> 14
gctcttagatg tatcggaaat tggc 24

<210> 15
<211> 24
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: CBH3-1 PCR
Primer

<400> 15
ccccccgggtt acaggcactg agag 24

<210> 16
<211> 2199
<212> DNA
<213> Cellulomonas fimi

<300>
<303> Gene
<304> 44
<306> 315-342
<307> 1986
<308> Genbank M15823
<309> 1993-06-04

<400> 16
ggatccggac ggtggcgac gtcgcccaca ccgacgcgcgt ggagacgacc ttcgcggacg 60
tcgcggacct cgccggcagg tgccggttcg gcgactgccc gcacgagcgg gagccggggt 120
gcccgggtcg ggcggccgac gaggcggcg acctgcggc cccggccgctg gactcgtggc 180
ggcgccttga gcgcgaggcg gcctaccagg cacggcgca gacgcggc tggccgcgaa 240
ggagcgcgca cgcttggaaa agatcaccaa ggagtaccag cggggatgc gcggggccggg 300
gcgtcccgaa agctgacggg cccgggaggc cccggccggc gcccgggtt gtccgctcg 360
cgccagcggg tgcgtggaa acgggtcgaa gccgcggcaac gtcgcggat cccggactgaa 420
agcgattagg aaatccatcat ccgcgtcgcc cgtggggcat tcgtcggtt tcctcgatcg 480
gaccgcacg agcgtgccac gaggccgaa cccaggggac tccttgatgt ccacccgcag 540
aacccgcgca gcgctgtgg cggccgcggc cgtcgccgtc ggcggctgtc cccgcctcac 600
caccaccgcg ggcaggcggt ctccggctg ccgcgtcgac tacgcgtca ccaaccagt 660
gccccggcgc ttcggcgcca acgtcacgt caccaaccc cgcgaccccg tctcgatcg 720
gaagctcgac tggacctaca ccgcaggcca gcggttccaa cagctgtgg aacggcaccgc 780
gtcgaccaac ggcggccagg tctccgtcac cagcctgccc tggaaacggca gcatccgcac 840
cgccggcact ggcgtcggtcg ggtcaacgg ctcgtggcc gggtccaacc cgcacgcggc 900
gtcgatcgat ctcacacggca ccacctgtcac gggcaccgtg cgcacgacca gccccacggc 960
gaccggacg ccgacgaccc ccacgcggac gccgaccccg accccacccc ccacgcgcac 1020
ggtcaccccg cagccgacca gggcttcta cgtcgaccccg acgacgcagg gtcaccgcgc 1080
gtggcaggcc ggcgtccggca cggacaaggc gtcgtcgag aagatcgac tcaccccgca 1140
ggcgtaactgg gtcggcaact gggccgacgc gtcgcacgc caggccgagg tccggacta 1200
caccggccgc gccgtcgccg cggggaaagac gccgatgctc gtcgtctacg cgatcccg 1260
ccgcgactgc ggctcgact cggcggtgg tgcgtccgag tccgagtgac cgcgtgggt 1320
cgacaccgtc ggcaggcgca tcaaggccaa cccgatcgat atccctgagc cgcacgcgt 1380
cgcgacgtc ggcgtactgct cggccaggc tgaccgcgtc ggcttcctca agtacgcgc 1440
caagtcgtc accctcaagg ggcgcgcgt ctacatcgac gccccacgc cgaagtggct 1500
gtcggtcgac acggcggtga accgcctcaa ccaggtcgcc ttcgagtgac cgggtggct 1560
cgcgctcaac acgtcgactt accagacgc ggcggacgc aaggcgatcg gccagcgat 1620
ctcgacgcgg ctggcgccgca agaagttcgat catcgacacc tcgcgcacgc gcaacggc 1680
gaacggcgag tggtgcaacc cgcggcccg cgcgtcgcc gAACGGCGG tcgcgtgtaa 1740
cgacggctcc ggcttggacg cgctccgtgt ggtcaagctg cccggcgagt cgcacgcgc 1800
gtgcacacggc ggcggcccg cggccaggatg gtggcaggag atgccttgg agatggcg 1860
caacgcagg tggtgagctg agacctcgcc cacgacgc ggcgcacgg cgcacgtgc 1920
tccgcgggtc ctggcggtccg gccgtggcg cccggacgtc gggggccgg ggacaatggg 1980
gcgggtggcag ggcaggacgc ggaccgcacc cgcacgcgg cgcgcgcgc tcgcgtgt 2040
gcgcgcggcgc cccgcaggcg tgccgacccc ggcgcggcg acccggtcc ggttacgc 2100
cgaggagctc gccgacgtgg ccccgccaa cgcgtcgag gtgcgcgtcc cgcacgcgc 2160
cgccgtcgca ggccgtcgag ggcggccgc acacccggg 2199

<210> 17

<211> 25

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: cenApst PCR
Primer

<400> 17
ggctgcaggc ggctgccgac tcgac 25

<210> 18
<211> 23
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: cemAsac PCR Primer

<400> 18
ccgagctctc accacctggc gtt 23

<210> 19
<211> 82
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: VSP leader coding sequence

<400> 19
tctagagtgc accatgaagt tttttttt ctttggca gcagtagttt tggttagctt 60
gccttgccac ggcgtgcag tc 82

<210> 20
<211> 2286
<212> DNA
<213> Clostridium thermocellum

<300>
<303> Nucleic Acids Res.
<304> 14
<305> 21
<306> 8605-8613
<307> 1986
<308> Genbank X04584
<309> 1999-02-10

<400> 20
aaactaaaaac tccttatccaa tacttttagtt cagttccagc atacgtctgt attcaaaatg 60
cctgtattta taactgcatt tataataacct gaagcaaata ataattaaac ttgtggaga 120
aaggagggtg caacagggtt taaattatct taattcaggt attttacaat ttttaataaa 180
aagggggata aaggtaaaaa atgagtagaa tgaccttgaa aagcagcatg aaaaaaacgtg 240
tgtttatctt gctcattgct gtatgtttc taagcttgac cgaggatattt ctttcggat 300

<210> 21
<211> 17
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: celDpst PCR
Primer

<400> 21
agctgcagaa ataacgg

<210> 22

17

<211> 26
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: celDsac PCR Primer

<400> 22
ccgagcttt atattggtaa tttctc 26

<210> 23
<211> 4578
<212> DNA
<213> Clostridium cellulovorans

<300>
<303> Gene
<304> 211
<305> 1
<306> 39-47
<307> 1998
<308> Genbank U34793
<309> 1999-03-09

<400> 23
taatatataa ataatattta aaatcaataa atcaatcgaa gaaaatttaa aaaaagagag 60
ggataatcaa tgagaaaaag attaaataag atcggtgctg ttgccttaac tgcaacaact 120
atatcatca tagcagctac tgttaataca gctcaagttt cagctgcacc agtagtgcca 180
aataatgaat atgttcaaca cttaaggat atgtacgcta agatccataa tgcaaacaat 240
ggataacttca gtgatgaagg aataccttat cacgcagttg aaacattaat ggttgaagca 300
ccagactatg gtcatgaaac tacaagtcaa gcttggatg taactgaaaa gtacataatt 360
ccaggtgaga ctgatcaacc aagcgcaagt atgagcaatt atgatccaaa taagccagct 420
acatatgcag ctgaacatcc agatccaagc atgtacccat ctcaattaca atttgggtct 480
gctgttagta aggtccatt atacaatgaa ttaaatcta cttatgaaac tagccaagta 540
tatggtatgc attggttact agatgttcat aactggatg gttttggatg tgcaacaagc 600
acaagcccag tatacatcaa cacttccaa agaggtgttc aagaatcttgc ttggaaact 660
gtgccacaac catgtaaaga cgaaatgaag tacgggtgaa gaaacggttt ctttagatcta 720
ttcaactggat attcacaata cgcaactcaa tttaaatata ctaacgctcc agacgcagat 780
gctcgtgcag ttcaagctac ttactatgca caattagctg ctaaagaatg gggagtagac 840
atcagctcat atgttagcaaa atctactaag atgggtgact tcttaagata ttcattctt 900
gataaaatact ttagaaaaagt tggaaattca acacaagcag gaactggata tgattcagct 960
caataccat taaactggta ctatgcttgg ggtggatggaa tcagctcaa ctggcttgg 1020
agaattggat caagccataa ccatttcgga taccaaaacc caatggcagc atggatatta 1080
tcaaatacat ctgactttaa accaaagtca ccaaattgtc ctacagattg gaataacagt 1140
ttaaagagac aaatagaatt ctatcaatgg ttacaatctg ctgaaggatgg tatcgctgga 1200
ggagcttaga actcaaattgg aggaagctat caagcatggc cagcaggtac tcgaacattc 1260
tacgaaatgg gatatactcc tcacccagta tacgaagatc cagtagtaa cgaatggttt 1320

1
2
3
4
5
6
7
8
9

ggtatgcaag catggtaat gcaacgtgtg gctgaatact actacagttc aaaagatcca 1380
gcagctaaat cattacttga taaatggct aaatggcctt gtgcaaatgt tcaattcgat 1440
gatgcagcta agaaatttaa gattcctgct aaatttagtat ggactggaca accagatact 1500
tggactggat catatacagg aaattcaaat ctcatgtta aagttgaagc ttatggagaa 1560
gatcttggag tagcaggttc actttctaat gcattatcat attatgc当地 agctcttga 1620
tctagcacag atgctgcaga taaagtagca tataacactg caaaagaaac ttctagaaag 1680
atacttgatt acttatggc aagctaccat gatgataagg gtatagcagt tactgaaaca 1740
agaaatgatt tcaaacgtt caatcaatct gtatataattc catcagggtt gacaggaaaa 1800
atgcctaattg gagatgtat ccaaagtggc gctactttct taagcatacg ttcaaaaatac 1860
aaacaagatc catcatggcc aatgttggaa gctgcttag caaatggtac tgggtttgat 1920
atgacataacc acagattctg gggtaaagt gatatcgctt tagcatttgg aacatacggt 1980
acattattca cagaccctac tccaggatta aaaggtgatg ttaactctga tgctaaagta 2040
aatgctatacg attagctat attaaagaaa tacatcttag attcaacaac taaaattaac 2100
actgctaatt ctgatatgaa cggtgatgaa aaagttatg caatggattt agcttttata 2160
aagaaagcac ttctgcttaa gattaaataa ctttagatcg aaattgttaag gttatttaag 2220
gctggacaat atcaagtata ttgtccagct actttaaaaa atattggaa acactgtgt 2280
aggttaaactt aaaccatgga tatgaaatatt agtaagatta atgccattgc tatggcaaac 2340
ttaaaaataa tatatttagat cataaaacatg aaatttaagt aaaaggcgaa taaaataattc 2400
cctaataaaa aaaattaagg ggtgaaacta gtgtttaaca tatctaagaa aaaagcgca 2460
gctcttctt tatcaggaat cttgggtgca acttcattt caccagctgt attggtaaaa 2520
gtgtaaacaa cagcgactcc aacattcaat tatggagaag cattacaaaaa gtcaataatg 2580
ttttatgaat tccaaacgttcc tggaaaggta ccaacggata ttctgttagaa ttggcgttgt 2640
gattctggaa caaaagatgg ctctgtatgta ggagttgatt taactgggtt atggatgtat 2700
gctggagacc acgttaaatt taatctgcca atgtttata ctgtggcaat gcttgcattgg 2760
tcattaaatg aagacaaagc agcttacaa aaaagcggcc aatttagatta cttgtttaag 2820
gaaataaaaat gggctacaga ttatctaatg aagtgcata cggcacaaaa tgaataactat 2880
tatcaagttt gtgtatgggg agctgatcac aaatgggtgg gacctgcaga agtaatgcag 2940
atggcaagac cggcttataa agtagattt caaaaaccag gatcatcagt tgctcgctgaa 3000
acagcagcag cattagcttc tacagctttt gcattaaaag acatagataa agcgtattca 3060
gaacaatgta ttcatgc 3120
gctggttata cagcagcaaa tacatattac aattcatgga gtggatacta tgatgaatta 3180
tcattggctg cagcatggct ttacatggca acaaataatg catcatatct agaaaaagcg 3240
gaatcatatg ttccattttt 3300
gcccattttt gggatgtatgt acatttcgga gctcaattac tccttgcac 3360
aaatcaatataaaat acaaagaatc agttgaaaga aacatttgcattt attggacaac tggttatgtat 3420
gaaataaaaat taaagtacac tccaaaaggta ttagcttggta tggattttt gggcttattttt 3480
agatatgcaatc ctacaacggc attccttgc gatgtttatg caagctcaga tggttttct 3540
atttcttaagg tagatacata taagaattttt gctaagatgc aagctgatgt tgcttttagga 3600
agtactggaa gaagttttgtt ggttaggatgg ggtgaaaatg ctccaaagaa accacatcat 3660
agaactgccc atagttcatg gtcagatcaa caagtaatc caacagacca tagacatgtt 3720
ttatatggc cttagttgg aggaccatg gccagtgtatg gttatactga tgctattgac 3780
aattttacta ataatgaggt ggcttgc当地 tataatgc当地 gatttgc当地 acttttagct 3840
agacaatattt ctaaatatgg cgagatccca atacctgattt ttaaagcgat agaaaaagcc 3900
accaacgatg agtttttgc当地 cgaagcggaa gtaaattgtatc caggtccaaa ttttgc当地 3960
attnaaagctt tagtaataa tagaacagga tggccagcaaa gaatgggaga taaactttca 4020
ttcaaataact tcataatgtt aagtgaattt gttatgttgc gttacatgtc agatgatgtt 4080
aaggttactg ttgggttacaa tactggcggaa actgtatcaa acctaataccc atgggataag 4140
gaaaataataa tttattatgtt aaatgttgc当地 ttcacagggg taaagatttgc当地 tccaggtggaa 4200

caatcagatt ataaaaaaga aattcaattt agaatttcag gaattcaaaa tgttaatatt 4260
tgggataatt ctgatgactt ctcttatgag gggattacaa aaactccagg tgaaacacct 4320
gtgaaggta caaacatccc agtttatgat aatggagtt aggtattcgg aatgaacca 4380
gaaactacta agccacctgt tatacgctgt gatgtaaaca ataatggtat cgtgaattca 4440
atggatttag cgatgttaaa gaaatatata cttggatacg aagttagaaat gaataaagag 4500
gcttcagatt taaataaaga tggtaagatt aatgccattt attcgcctt tttaaagaaa 4560
ctactttat cacagtag 4578

<210> 24
<211> 24
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: exgSnar PCR
Primer

<400> 24
cggggcgccg caccagtagt gccca

24

<210> 25
<211> 24
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: exgSsac PCR
Primer

<400> 25
ccgagcttt atttaatctt aagc

24

<210> 26
<211> 5971
<212> DNA
<213> Thermobifida fusca

<300>

<400> 26
gcggccgcca ggtggggcgg ccgagtcga cggtgccag gacttcgacc ccgtggcgt 60
cagcgaagca tgcttcgctg acgttggcgg cggtagcag gcctaccccg gtgccggta 120
tccccgaagt ggtggcgagt tcttcgaggt gggttgtccgg gtcgggtccgc cggtagtcgc 180
cgtcgactt ggcgttcatg acgtatccc gtggtccgg gccggcccg agcacgctgg 240
aggcggccat ggcgcagccg gggccgcact gccagagcac tgcggcaagg gcgcggccgt 300
tgtcgcccg ccagcgcagg tgcgcggta ggagggtgcc gtcggccgatc gtctccgtgt 360
ccactccgtt ctccagggtc gggtccgcgg ggccacttta acgagtccgc atcgggcggc 420
agcggggta tgcttcatc tggcgaaatg ccacgcggag tactgcgagt ctcacgcttc 480

8
7
6
5
4
3
2
1

gtcccattgt cttttacgg agggtttaca cggcacatcc ggaacgttac cctcctactg 540
ggagcgctcc cgtgactca gccacagggc cccttccgg ggcgagcccc caccaccccg 600
ggaaggccac tgcgaccct gagtcattt catgggagcg ctcccatgcc agtgctcccg 660
gcagaaaagga gagaaccgg aaccggtacc gctggttca ctgatcccc tggggcacc 720
cggcacatgcc ccgacaccag cgatgccacc cccggcggc ctgcagtcca caccggcac 780
gccgcacacc ccttcctgt gtgacacgcg gttccgaacg gccttgcgg ttctcggtat 840
gccgacgaac ggcacggctg ctccggaaacc ggaagatccg gaggttattt ccaagcatga 900
gatcgttact gtctcccg cgctggcga cgctggcctc gggggcgctc gcagcggccc 960
tggccgccc tgcgtacttcc cccggcgctg cgacacgcgc cgtcgcctgc tcgggtggact 1020
acgacgactc caacgactgg ggtagcggt tcgtcgccga agtcaagggt accaacgaag 1080
gcagcgaccc catccagaac tggcaagtag gctggaccc ccccggttaac cagcagatca 1140
ccaacggctg gaacggcggt ttcagccaga gcggcgccaa cgtcaccgtc cgctaccgg 1200
actggAACCC caatatcgcc cccggagcca ccacatccctt cggttccag ggacactaca 1260
gcggctccaa cgacgcccc accagcttca ccgtcaacgg cgtcacccgtc agcggatccc 1320
agccccccaa cctggccccc gatgtcaccc tgacatcccc ggccaacaac tcgacccccc 1380
tggtaacga cccgatcgag ctgaccggc tcgcctccga ccccgacggc tcgatcgacc 1440
gggttggaaatt cgccgcccac aacaccgtca tcggcatcga caccacccctt ccctacagct 1500
tcacccggac ggacgctgcc gccggctct actcggtgac cgcgatcgcc tacgacgacc 1560
agggagccag gaccgtctcc gctcccatcg ccacccgagt gctggaccgg gccggcgta 1620
tcgcctcacc gcccacccgtc cgctggcgc agggcgac cgccgacttc gaggtgcggc 1680
tgtccaaacca gcccggcgc aacgtcacgg tcaccgtggc gcgcacgtcg ggcagctccg 1740
acctgaccgt ctccagcgcc tcccaactcc agttcacctc cagcaactgg aaccagccgc 1800
agaagggtgac catcgccctcc gctgacaacg gcgaaacact ggccgaggcg gtcttcaccg 1860
tcagcgcccc cggccacgac tcggccgagg tgacgggtcg ggagatcgac ccgaacacca 1920
gctcctacga ccagccctc ctggagcagt acgagaagat caaggacccc gccagcgct 1980
acttccgca attcaacggg ctccctggtcc cctaccactc ggtggagacc atgatcgctg 2040
aggctccgga ccacggccac cagaccacgt ccgaggcggt cagctactac ctgtggctgg 2100
aggcgtacta cggccgggtc acccggtgact ggaagccgt ccacgacgcc tgggagtgcg 2160
tggagaccc ttcatcccc ggcaccaagg accagccgac caactccgccc tacaacccga 2220
actccccggc gacccatccatc cccgagcagc ccaacgctga cggctaccgg tcgcctctca 2280
tgaacaacgt cccgggggtt caagacccgc tcgcccagga gctgagctcc acctacggga 2340
ccaacgagat ctacggcatg cactggctgc tcgacgttgg caacgtctac ggcttcgggt 2400
tctggggcga cggcaccgac gacgcccccc cctacatcaa cacctaccag cgtggcgcc 2460
gcgagtcgt gtggagacc attccgcacc cgtcctgcga cgacttcacg cacggcgcc 2520
ccaacggcta cctggacccctt ttcacccgacg accagaacta cgccaaacgcg tggcgctaca 2580
ccaacgcccc cgacgctgac gcgcggggcc tccaggttat gttctggcg cacgaatggg 2640
ccaaggagca gggcaaggag aacgagatcg cggccctgtat ggacaaggcg tccaaagatgg 2700
gcgactacct cccgtacgcg atgttcgaca agtacttcaa gaagatcgac aactgcgtcg 2760
gcgcacccctc ctgcccgggt ggcacaggca aggacagcgc gcactacccgt ctgtcctgg 2820
actactcctg gggccggctcg ctcgacaccc cctctgcgtg ggcgtggcgat atcggttccca 2880
gctcctcgcga ccagggctac cagaacgtgc tcgctgccta cgccgtctcg caggtgccc 2940
aactgcagcc tgactcccc accgggttcc aggactgggc caccagcttc gaccggccagt 3000
tggagttccct ccagtggctg cagtcgcgtg aagggttat cggccgggttgc gccaaccaaca 3060
gctggaaagg aagctacgc accccggccga cccggctgtc gcagtttctac ggcatgtact 3120
acgactggca gccggcttgg aacgacccgc cgttccaaacaa ctggttcgcc ttccagggtct 3180
ggaacatgaa gcgcgtcgcc cagctctact acgtgaccgg cgacgccccgg gccgaggcc 3240
tcctcgacaa gtgggtggc tggggccatcc agcacaccga cgtggacgccc gacaacggcg 3300
gccagaactt ccaggtcccc tccgacccctt agtgggtggg ccagcctgac acctggaccg 3360

6
5
4
3
2
1

gcacctacac cgccaacccg aacctgcacg tccaggtcgt ctctacagc caggacgtcg 3420
gtgtgaccgc cgctctggcc aagaccctga tgtactacgc gaagcgttcg ggcgacacca 3480
ccgcctcgc caccgcggag ggtctgctgg acgcctgct ggcccacccg gacagcatcg 3540
gtatcgccac ccccagcag ccgagctggg accgtctgga cgaccctgtgg gacggctccg 3600
agggcctgta cgtgccgccc ggctggtcgg gcaccatgcc caacggtgac cgcatcgagc 3660
cgggcgcgac cttctgtcc atccgctcgt tctacaagaa cgaccctgt tgccgcagg 3720
tcgaggcaca cctgaacgac ccgcagaacg tcccggcgc gatcgtggag cgccaccgct 3780
tctggctca ggtgaaaatc gcgaccgcgt tcgcagccca cgacgaactg ttccccccg 3840
gagctccctg atcctgaaca gtccgtctcc tgaccggcgg tccgtggcgg cgtagtgtc 3900
ccccgcgcg gaccgcctc caccaccccc ctggggccgt cggcgcacc aacacccgac 3960
ggccccagac tccttcacg gcctgtact cggccgcacg cccgcctta tccagcccga 4020
tcaaccagt cagcgtagtc cgggtgcgc tcgagccacg cttgacata gggcagacc 4080
gcacgcaccc gcagccgcg ggccgcaca tcatccaacg cttccgcac cagccggctg 4140
cccatccct tccctggaa agagccgtcc acccgagtgt ggaagaagac caccgcata 4200
ccggcaacag gctggatttc cgtgaaacccg gcgattttct ccccgccacg gatctcgta 4260
cggtgctgtg ccggattgtc gatcacccgt acatccatgg cgttccctc ccgttcccc 4320
ggcggcggcg catctctcat ccggcggcct gccaggact gtccctttcc ccaggacagc 4380
ctgagcacgc gcccgcacgg cgaacccca gCACAGCCCT agcatggta acggccacgg 4440
tcgcaggccg accacgacac cgaggaggag ttagtggcga cggcgcaca gtacgccacc 4500
cttccgtacg tgccgtatca ccggcagcgt tggacgaggc ggtacgcgtc ctgcggcag 4560
gcggcctcgt agcttcccc accgaaacccg tctacggcct aggccggac gccgcgaacc 4620
cggccgcgtt agcgcgcatt ttgcgcgca aaggccgtcc cgctgaccac cccctgatcg 4680
tgcacgtcgc ttccgcggag agcgcgcgcg actgggctgc tacctttct cctctcgccc 4740
gcacgctgca ggacgcgttc tggcccgcc cgctgaccct catcctcccc cgctccgccc 4800
aagtgcgcga cgcagtgacc ggtggacgcg ccacggtagg gctgcgggtc cccgaccagc 4860
cggtcgcgtt cgcactcctg gaacgcttcg gcccggaaat cgccgcaccc tccgcgaacc 4920
gttccggccg agttagcccc accacggccg cgacacgttc cgctgaccc ggggaccggg 4980
tcgaccttgt gttggacggc ggaccgtgca cggtcggcgt ggaatcgacg atcgtcgaag 5040
tggccgacgg ccggctcacc gtgctccgca ccggaggcat caccccccac gacccctggc 5100
cggtcacccgg agccccccgc gacaccaccc ccacccggacc gggccggca cccggcatgc 5160
tcgcccggcca ctacgcaccc gccgcacggg tcgtgttagc cgaagcagca gaagccgcgg 5220
acacggtcgc ccagtgggtg gagaaaggac accgggtggc tggctggcg gagaccgcta 5280
ccgtccccca aaacctgcgg gaaggcgtgg tgggtctacc gtccctgtct tcggctcg 5340
actatgcggc cgtgtgtac cagcggctgc gggacgtgga cgccggcgaa gcccacgtgg 5400
tcgtcgcat ccccccggaa cccgcgggaa tcggcttggc ggtacggac cgctgctgc 5460
gcgcacccgg ggccgactga cctctcccc tggggcaagg gatTTTCCG catagacgag 5520
cccgtttccg ggatctcttt ctgtggagac agaaagagag caccgacacc agggaggggc 5580
gatgaaagct caagccggag accggatcgt tggtaacgc ccccgcgatg acctgcccgc 5640
gcgcaaaggc gtcgtgtca aagtgcaggg ggacaacggg gggccgcctt actgggtgcg 5700
gtgggaggac gaaggccggg aaacctcgt ctacccggaa ccggacgccc gtatcgagcc 5760
ccgcccaccc gtcffffcaag cccgcggagga gcatacggag gcccgtcaac cgccggccgg 5820
acagtcctg aaacggatac agatcgacgt cgcaactgccc gtccaccaag tggAACCTGC gcggccacgg 5880
cgtgcgcacc ctcggcgaag cgcaactgccc gtccaccaag tggAACCTGC gcggccacgg 5940
agaagcacgc aagcatccca ccgacgcggat t 5971

<210> 27

<211> 21

<212> DNA

THE JOURNAL OF CLIMATE

<213> Artificial Sequence
<220>
<223> Description of Artificial Sequence: celFpst PCR
Primer

<400> 27
acgctgcagt cgccctgctcg g

<210> 28
<211> 23
<212> DNA
GAGCTGCAGT CGCCCTGCTCG G

<220>
<223> Description of Artificial Sequence: celFxm_a PCR
Primer

<400> 28
ccccccgggtc agggagctcc ggc

21

<210> 29
<211> 15
<212> DNA
<213> Artificial Sequence

23

<220>
<223> Description of Artificial Sequence: 2777 PCR
Primer

<400> 29
ggccacacctgg gcagg

15

<210> 30
<211> 17
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: M13-20 PCR
Primer

<400> 30
gtaaaaacgac ggccagt

<210> 31
<211> 15
<212> DNA

17

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: 3227 PCR
Primer

<400> 31

gcgacgctcg ggccg

15

<210> 32

<211> 16

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Reverse 3227
PCR Primer

<400> 32

aacagctatg accatg

16